

An aerial photograph of a river flowing through a dense forest. The river is filled with numerous large, fallen logs and branches, creating a complex network of obstacles. The water appears slightly turbid. The surrounding forest is lush with green trees, some showing early autumn colors. The sky is overcast and hazy.

2016

Aquatic and Riparian Restoration Annual Report

USDA Forest Service
Pacific Northwest Region



for the greatest good

Photo credit: John Gussman,
Jamestown S'Klallam tribe

USDA Forest Service Pacific Northwest Region 2016 Aquatic and Riparian Restoration Annual Report

Each year, the Pacific Northwest Regional Fish and Watershed Programs produce an aquatic and riparian restoration annual report, highlighting the excellent achievements of the National Forests in the Region by featuring a particular project on each Forest. This year, we start by highlighting some of the restoration-related accomplishments of Regional Fish and Watershed personnel in the Regional Office. These include development of tools and partnerships to advance the conservation of watershed and aquatic resources, as well as informational exchange and professional development for Regional, Forest, and District personnel.

The development and completion of a number of restoration tools occurred this year, including Forest planning tools, databases, conservation strategies, and assessment tools. 2016 saw the completion of a major revision of the Regional Aquatic and Riparian Conservation Strategy, intended to guide Forest plan revisions throughout the Pacific Northwest Region and parts of Northern California. Aquatic and riparian restoration will be facilitated by the completion of the Regional Fish Migration Barrier Database and the Aquatic Restoration Biological Opinion (ARBO) Reporting Database and the continued development of the Regional Fish Distribution Database and the Water Rights and Use (WRU) Database. The new Regional Fish Migration Barrier Database enables us to better plan, prioritize, and track fish passage project accomplishments. When used in conjunction with the Regional Fish Distribution Database, we can now quantify passage achievements for any species of interest included in the database. The fish distribution database will also be used to monitor the restoration of fish distribution over the long term. We thank the Forests and Data Resource Management personnel for their crucial role in the development of these databases. The ARBO programmatic database facilitates tracking and reporting of ARBO-related restoration projects. We continued to make progress implementing the national WRU database application to improve management of water uses.

While conservation strategies can be used to identify, prioritize, coordinate, and fund restoration actions intended to benefit rare species, assessment tools facilitate restoration planning. In 2016, Regional and Forest personnel helped in the completion of the conservation strategies for Redband and Pacific Lamprey, where we co-led the Redband conservation strategy team with State and Tribal agencies and participated in the lamprey conservation strategy interagency team. 2016 brought advancements in assessment tools, including those associated with climate change, roads, and best management practices. Regional and Forest personnel also continued work with our research partners in developing applying a comprehensive suite of climate change analysis tools to characterize potential changes in stream flows and stream temperatures in South Central Oregon and their effects on water uses, infrastructure, and fisheries, providing an adaption strategy for increasing the resilience of ecosystems for long-term species survival. Additional progress on restoration-related tools includes ongoing collaboration with FS Research on the development and testing of a streamlined version of the Geomorphic Road Assessment and Inventory Package (GRAIP), a powerful tool for characterizing road risks to aquatic resources and prioritizing them for restoration or mitigation. Lastly, we completed the first multi-year, regional-scale analysis of the implementation and effectiveness of Water Quality Best Management Practices based on consistent data collection and reporting from Forest personnel.

Partnerships are instrumental to our accomplishments in restoration. At the regional level, the Salmon Superhighway (SSH) Partnership (<http://www.salmonsuperhwy.org/>) gained traction and the Drinking Water Providers Partnership (DWPP) (<http://www.workingwatersgeos.org/source-water/dwpp>) was initiated. Work with the Washington Watershed Restoration initiative (WWRI) continued. The SSH uses a unique approach to categorize and prioritize fish passage restoration at a landscape scale. Considered a demonstration project, it is an approach that can be applied to other watersheds throughout the region. The DWPP fosters grassroots partnerships between drinking water providers and restoration practitioners to restore municipal watersheds, many of which are located on National Forest lands, benefitting water quality and fish. In 2016, an interagency grant program was initiated, supporting 11 municipal watershed restoration projects. In 2016, we continued our regional partnership with the WWRI, which is focused on reestablishing and maintaining healthy aquatic and forest ecosystems through the maintenance, repair, and reclamation of forest roads and trails. Specifically, with input from WWRI, the Region and the Forests developed a new \$16 million program of road and trail restoration work for FY17-19. This work will enable the Region to complete essential aquatic restoration work in priority watersheds and move towards a more sustainable transportation system.

We are a national leader in aquatic restoration in part because we continue to provide opportunities for employees throughout the region to exchange information and grow professionally. We have several forums for this, including X-Border sessions, forest visits, interaction with two Region restoration assistance teams, and targeted workshops such as aquatic invasive species training (AIS) for our Law Enforcement Officers (LEO). The X-Border sessions are 24-hour field trips on Forests for personnel from neighboring Districts and Forests, focusing on aquatic and riparian resources. Forest visits are more interdisciplinary in nature. They involve a Regional Office interdisciplinary team review of Forest accomplishments and future plans. Both X-Border sessions and Forest Visits provide opportunities for restoration-related learning. Beyond helping Forests design of watershed restoration projects, the Regional Restoration Assistance Team (RAT) (for watershed restoration projects) and the Regional Design Assistance Team (DAT) (for aquatic organism passage projects) also provide mentoring and learning opportunities for Forest staff. Also, after being trained by Regional and state personnel, our LEOs have taken on the responsibility of communicating with the public about the hazards of AIS and methods to prevent their spread.

In 2016, work by Regional, Forest, and District personnel along with many partners continued to help restore watersheds and aquatic resources across the Region. This includes completion of all essential restoration work in 7 priority watershed across the Region. The Regional Office will build upon this progress by continuing to develop and provide tools, partnerships, and professional growth and development opportunities for Forest and District personnel.



Cedar Lake, Okanogan-Wenatchee National Forest

**USDA Forest Service Pacific Northwest Region
2016 Aquatic and Riparian Restoration Annual Report**

REGIONAL FISHERIES AND WATERSHED PERSONNEL

James Capurso

James Capurso
Regional Fisheries Biologist
503-808-2847

Brian Staab

Brian Staab
Regional Hydrologist
503-808-2694

Kimberly Conley

Kimberly Conley
Assistant Regional Fisheries Biologist
503-808-2654

Caty Clifton

Caty Clifton
Water Quality and Water Rights Manager
503-808-2696

John Chatel

John Chatel
Regional TES Program Manager
503-808-2972

Cara Farr

Cara Farr
Regional Soil Scientist
503-808-2937

Scott Peets

Scott Peets
Fisheries Biologist
(Oregon Salmon Plan Liaison)
541-750-7181

Bob Metzger

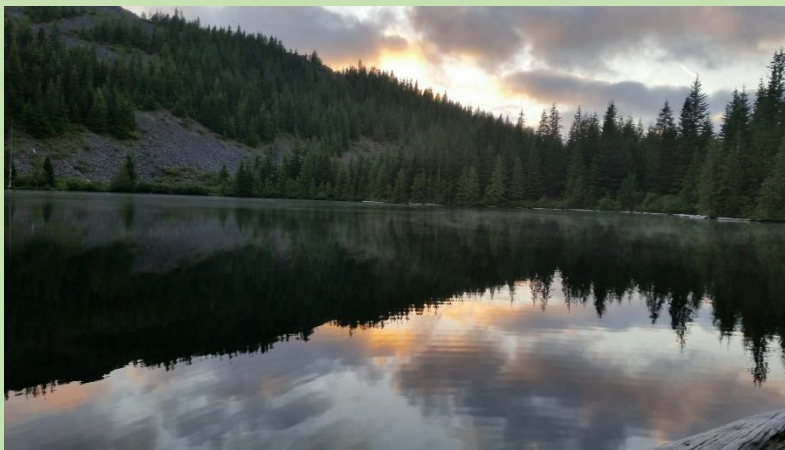
Bob Metzger
Fisheries Biologist
(Washington Salmon Plan Liaison)
360-956-2293

Katie Serres

Katie Serres
Fisheries Biologist
(Level 2 Stream Surveys)
503-630-8784

Scott Woltering

Scott Woltering
TES Fisheries Biologist
503-808-2669



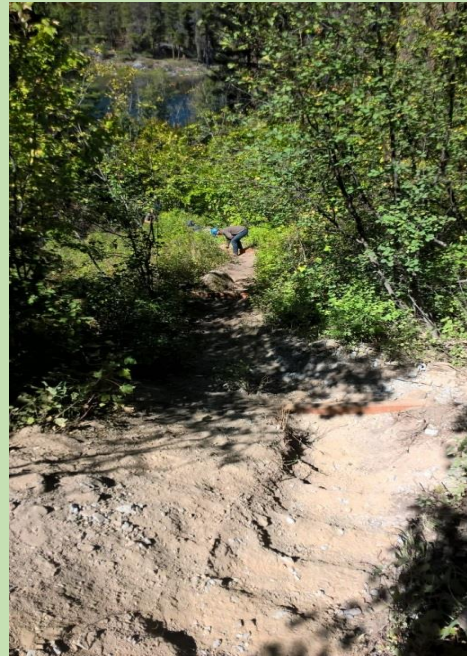
Shining Lake, Mt. Hood National Forest

COLVILLE NATIONAL FOREST

Swan Lake Riparian Restoration

Swan Lake is a 60-acre recreation paradise with 25 campsites, a day use swim beach, a fishing dock, and a lakeside trail. The lakeshore and riparian areas near the lake receive heavy recreation pressure from visitors, creating negative impacts to the lake. In the summer of 2016, the Northwest Youth Corps (NYC) camped at the Forest Service campground and worked on reducing environmental impacts caused from recreationists on the lakeside trail. Two miles of trail were treated by the NYC to improve drainage and reduce erosion. They also relocated a portion of the trail out of sensitive wetlands.

Around the most heavily used areas, an aggregate was placed to harden the trail and kept in place by retaining walls, also limiting off trail travel. One of the main objectives of the project was to discourage user-created pathways by obliterating old pathways. In heavily used areas, the youth crews installed check dams to control erosion and added topsoil to encourage revegetation.



Defining the trails with fencing and borders limits the amount of disturbance to the surrounding vegetation



Check dams were installed to define and reduce erosion at the swim beach. Topsoil was placed in the check dams to facilitate revegetation.



600 feet of user created pathways (top photo) were obliterated, check dams installed to reduce future erosion, top soil added to encourage revegetation, and slash spread to curtail future use.

For more information on this project and other restoration projects on the Colville National Forest, contact Karen Honeycutt, Natural Resources Program Manager (Fisheries, Wildlife, TES, Soil and Water) at 509-684-7224.

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

Sandy River Delta Restoration Protection Fence

This year's Columbia River Gorge National Scenic Area (CRGNSA) aquatic restoration project ensures that other past restoration projects can provide undisturbed habitat for fish and wildlife, and promote a conservation ethic in a multiple-use environment that also fosters recreation use.



Aerial view of the Sandy River Delta project site.

At the west end of the Columbia River Gorge National Scenic Area (CRGNSA) lies the 1,400 acre Sandy River Delta (SRD), just east of Troutdale, OR. The SRD has gone through many changes in the last hundred years, changing from a landscape of hardwood forest to one of grazing and agriculture. A dam was built in the 1930s in an effort to improve smelt (*Eulachon*) migration. The dam was removed in 2013 to improve steelhead and salmon migration, and to re-establish the original main channel of the Sandy River. The SRD is host to many species of fish and wildlife, including federally listed salmon and steelhead, regionally sensitive painted turtles and bald eagles, and migratory birds that, each spring and fall, utilize this vast riparian and wetland area in the western Columbia River Gorge.



Adjacent photos: Partners building the protection fence.

The SRD has been under National Forest System management for less than 30 years, and for over 20 years CRGNSA has taken huge steps to restore the landscape and improve riparian and wetland habitat for wildlife and fish. Vast acreages, on Sundial Island to the north, and on the mainland, have been transformed from weedy pasture to young bottomland hardwood forest, invasive blackberry has been controlled, and many thousands of grasses, forbs, shrubs and trees have been planted. In past projects, wetland formation has been encouraged by improving channelization, an experimental periodic pumping of ground water, under burning, application of herbicides and goats, and a great deal of native planting. Most recently, in 2014-2015, in partnership with the Lower Columbia Estuary Partnership, the Thousand Acre Habitat Restoration project further enhanced seasonal wetlands and channels at the east end of the SRD for wildlife and federally listed salmon and steelhead.

With the SRD being directly adjacent to metropolitan Portland, there has been a yearly increase of recreational use. Today, each year, thousands of people hike the system trails, walk their dogs, picnic at the SRD, and swim in Sandy River, utilizing the recently expanded parking lot near Interstate 84 for access. It has quickly become apparent that while recreation has become an integral part of the SRD landscape, equally important is protecting the riparian and wetland areas.



Protection fence demarcating recreational use area from natural resource conservation area.

To this end, over the last four years, with initial funding assistance from the Sandy River Basin Watershed Council and utilizing the help of volunteers from groups like YESS (Mount Hood Community College Youth Education and Support Services), a 1.25 mile buck and rail fence has slowly been constructed across the SRD landscape demarcating west-end SRD recreational use from an east-end SRD natural resource conservation area. This fence is now 80% complete. Internal challenge cost share grants have funded the placement of resource protection signage and the planting of pollinator-attracting native plants along the fence to encourage the visiting public and their dogs to remain on the west side of the fence, and leave the east-end of SRD undisturbed as wildlife and fish habitat. In summer months, CRGNSA field rangers interpret this fence for the visiting public. All of these things are slowly creating a greater philosophy of aquatic and terrestrial conservation stewardship within the visiting public. Hence, the SRD fence, while helping to maintain past restoration projects on the east side of SRD, is itself a restoration project that helps protect aquatic and wildlife resources in this part of the CRGNSA.



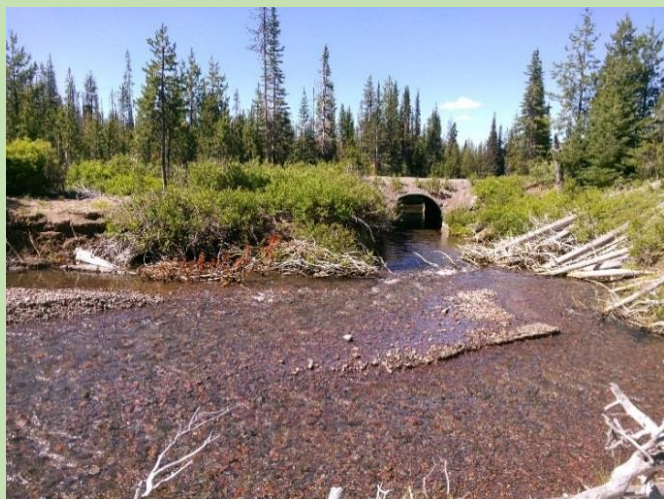
Partners installing signs along the protection fence.

For more information on this project and other restoration projects on the Columbia River Gorge National Scenic Area, contact Brett Carré, Wildlife and Fisheries Program Manager at 541-308-1718.

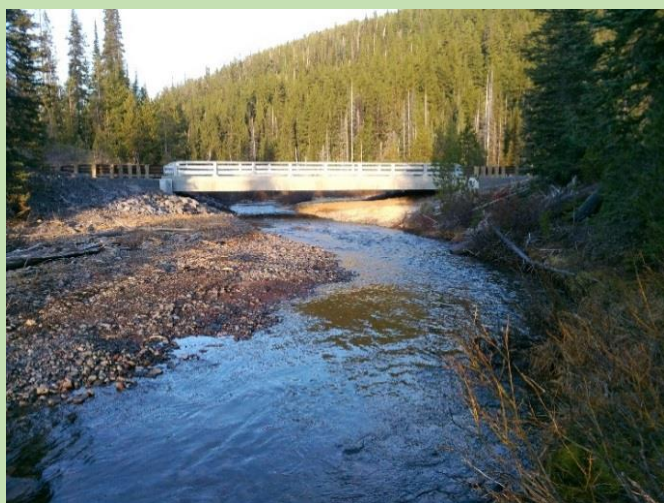
DESCHUTES NATIONAL FOREST

Soda Creek Aquatic Organism Passage

The Deschutes National Forest, utilizing Federal Highways Administration funding, replaced an undersized culvert that restricted aquatic organism passage on Soda Creek, a tributary to Sparks Lake. Westslope Cutthroat Trout, Eastern Brook Trout, Western Toads, Tailed Frogs, and other amphibians occupy Sparks Lake and Soda Creek, and potential habitat exists for Oregon Spotted Frogs in Sparks Lake.



Undersized culvert pre-implementation



Channel-spanning bridge post implementation

Three flood events in Soda Creek between 1966 and 1972 resulted in damage to the highway at the crossing from excessive flow and debris at the undersized culvert. The nine foot diameter culvert was undersized for the

21-foot wide bankfull channel, creating a hydraulic jump at the outlet of the steel pipe restricting fish and other aquatic organism passage. A bridge replaced the undersized culvert with a combined 54-foot wide bankfull channel and floodplain allowing for passage of debris and flood flows.

The stream simulation project design allowed fish passage and channel stability through the crossing. Approximately 120 feet of stream channel upstream and 100 feet downstream of the crossing were restored to properly align the stream at the crossing and allow for a stable channel dimension, pattern, and profile. This involved the placing wood at the toe of the channel, constructing three pool-riffle sequences, transplanting mature on-site willows, and seeding native species.

Construction of the bridge required a re-route of the busy Cascade Lakes Highway and a stream bypass through a temporary culvert. A temporary bridge and road were constructed on the downstream side of the crossing and then removed at the conclusion of the project.



Planting willow and developing floodplain

For more information on this project contact Tom Walker, Fisheries Biologist at 541-383-4787; for other restoration projects on the Deschutes National Forest, contact Jason Wilcox, Fisheries Program Manager at 541-383-5534

FREMONT-WINEMA NATIONAL FOREST

Upper Williamson River Large Wood Placement

The Upper Williamson River is a spring fed system with minimal seasonal flow fluctuation. The river has a highly erodible channel bed and river banks due to volcanic sediment deposited by the Mazama eruption of approximately 7,000 years ago. The low gradient floodplain forms wet meadows and scrub-shrub wetlands that are saturated to surface year-round, throughout much of its length.

The river traverses a broad grass valley bottom and is a traditional camping area for the Klamath Tribes. Klamath Tribal members enjoy recreating on the river and fishing for native Redband Trout.



For fly fishing recreationalists, nearly every day in the month of July the upper Williamson River becomes a blizzard of *Hexagenia limbata*, a 1 ½ -inch-long mayfly that is the second largest mayfly species in North America. These “monster” hex hatches on the upper Williamson River provide conditions merely indescribable for fly fisherman. It’s not uncommon to catch healthy native Redband Trout and Brook Trout nearly every cast.



To further enhance the fishing on the upper Williamson River, the USFS partnered with Trout Unlimited to provide instream cover and increase habitat complexity within the river system. Level II Stream Surveys determined the river was lacking large woody debris for most of its length. In the late summer and early fall, excavators began placing large wood strategically throughout the river system. Over 7 miles of river were treated and over 300 pieces of large wood were laid in the river. Logs were not keyed into banks due to the low gradient and consistent spring fed flows of the river.

This project connects restoration work that was completed on private land adjacent to USFS reaches. In 2012, the Fremont-Winema National Forest, through partnerships with USFWS and private landowners, placed wood in about 6.5 miles of private land upstream and downstream of USFS managed lands. Altogether there is now approximately 15 continuous river miles treated with more occurring in the future. In the fall of 2017, implementation of the third phase will complete this 2-year project. Partners include Trout Unlimited, Oregon Department of Fish and Wildlife, and the Klamath Tribes.

For more information on this project contact Kyle Gomez, Fisheries Biologist at 541-883-6734. For information regarding other restoration projects on the Fremont-Winema National Forest, contact Phillip Gaines, Fisheries Program Manager at 541-947-6258.

GIFFORD PINCHOT NATIONAL FOREST

Lewis River Mainstem Fish Habitat Restoration



The Lewis River Mainstem Fish Habitat Restoration Project constructed 8 complex Large Woody Material (LWM) structures in a 1000-foot stretch of river previously lacking in LWM. The project goal was to improve salmonid habitat by increasing habitat complexity and diversity, increasing spawning opportunities for adults, and providing both winter refugia and summer rearing opportunities for juveniles. The target species were Coho and Chinook salmon, steelhead trout, and Bull Trout.

can be a stepping stone for a career in fisheries or watershed management. In the 2016 field work season, one intern from Clark College was employed to assist in the monitoring of the Lewis River. Monitoring included longitudinal profiles before and after project implementation, cross sectional profiles, and photo documentation. These profiles will be repeated in future years.



Structure 6 - Looking left bank to right bank

Community engagement included the ongoing partnership with Mount St. Helens Institute (MSHI). One aspect of what MSHI provides is internships for undergraduate students studying fisheries science which



Structure 7 - Looking upstream to downstream along the left bank

For more information on this project on the Gifford Pinchot National Forest contact Bryce Michaelis, Zone Aquatic Technician at 360-449-7847.

MALHEUR NATIONAL FOREST

Camp Creek Headwaters

Camp Creek, a vital tributary to the Middle Fork John Day River, is a Forest Priority/Focus watersheds and is identified as a high priority stream for steelhead recovery. Mid-Columbia River steelhead occupy Camp Creek but the habitat is highly departed from desired conditions. Limiting factors identified within the Mid-Columbia River Steelhead Recovery plan (Sept, 30, 2009) include: degraded riparian plant communities, floodplain connectivity and function, and channel structure, complexity, and water quality (temperature). Stream hydrology and sediment routing have also been impacted. Due to more than 8°F differences in water temperature between the upstream and downstream ends of the four mile project reach, the project focused upon improving juvenile rearing habitat through the creating pools, reconnecting floodplains, increasing water table elevations, and restoring riparian hardwood communities.

whips and other vegetation interwoven between vertical posts driven into the streambed. The structures are sealed with substrate material taken from the streambed. As the willows take root, they will provide a “live” vegetative base, increasing the life span of the BDAs. The objective of the BDAs is multifold: (1) raise water tables upstream of the BDA to reconnect floodplains and abandoned side channels (2) promote sediment deposition upstream of BDAs to promote growth of riparian vegetation and promote floodplain connectivity, (3) attenuate peak flows to increase water storage later into the summer, (4) provide more miles of high quality juvenile steelhead rearing habitat, (5) provide cover and habitat to facilitate expansion and colonization by beaver of headwater meadow areas (6) decrease stream energy within incised channels allowing deposition to occur.



Camp Creek within project areas in 1970s.

Beaver were historically abundant within the Camp Creek watershed and throughout the John Day basin. Their dams had a strong influence on the vegetative productivity of riparian corridors and on ground and surface water flow regimes. In the 1800s and 1900s, beaver trapping was widespread throughout the John Day basin. The reduction in the beaver population was one factor which led to a loss of floodplain connectivity as well as a loss of channel sinuosity and complexity.

Beaver dam analogs (BDAs) are porous, channel spanning structures designed to mimic beaver dams and raise the water table upstream of the structure. BDAs have willow



Example of Post Vane with AmeriCorps crew



Sealing the BDA with willows and substrate material.



BDA fully sealed and impounding water. Large wood was added near bank to deter livestock and wildlife access to sprouting willows.

Seventy BDAs were constructed on a four mile reach of Camp Creek in conjunction with 88 large wood jams within the active channel, 56 wood jams within historical flow paths (~8 miles), 8 post vanes, 7 rock vanes, 3500 cottonwoods and 1500 willows were planted within the floodplain. In addition to traditional planting, a portion of the 10,000 (+/-) willow whips (coyote willow) woven into the BDAs are expected to take root, providing direct shade to the pools created by the BDAs. The project also consisted of legacy structure removal (approximately 45 log weirs).



Example of Large Wood Structure with spawning gravel tailout



Example of channel spanning wood jam and historical flow path activation

The project was made possible through partnerships and cooperation with The Confederated Tribes of Warm Springs Reservation of Oregon, Oregon Department of Fish and Wildlife, Burns Paiute Tribe, Morgrass Grazing Association, Oregon Natural Desert Association (ONDA), AmeriCorps, and several private landowners who allowed the USFS to harvest willows from their private property. The Confederated Tribes of Warm Springs Reservation of Oregon was instrumental in providing matching funds, project materials, and labor.

For more information on this project and other restoration projects on the Malheur National Forest, contact Steve Namitz, Fisheries Program Manager at 541-575-3167 or Tom Friedrichsen, Forest Hydrologist at 541-573-4329



BDA complex with large wood jam just upstream after BDA sealing was completed.

MT. BAKER-SNOQUALMIE NATIONAL FOREST

Cranberry Creek Aquatic Organism Passage

Cranberry Creek is a tributary to the South Fork Stillaguamish River and supports federally listed steelhead and Bull Trout as well as other unlisted salmonid species, such as Coho Salmon and Coastal Cutthroat Trout. It is considered important to the Stillaguamish Tribe for its Coho Salmon spawning and rearing. Cranberry Creek crosses the Mt. Loop Highway, which is managed by Snohomish County before it traverses across National Forest System lands along the SF Stillaguamish and Sauk rivers.



Culvert inlet at Cranberry Creek pre-implementation.



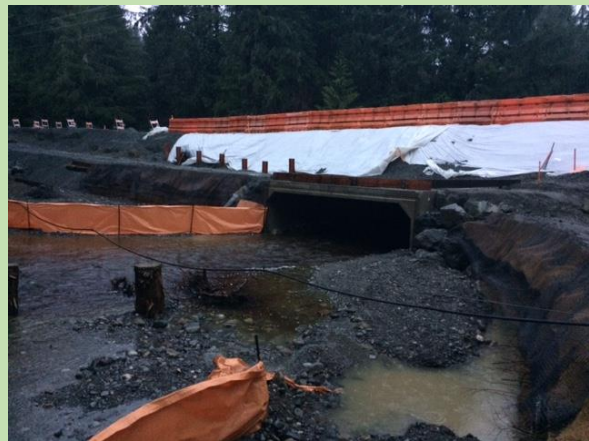
Culvert outlet at Cranberry Creek pre-implementation.

In 2014, a partnership was formed between the Mt. Baker-Snoqualmie and Olympic national forests and the Environmental Protection Agency (EPA). This partnership enhanced the Forest Service and EPA's ability to develop plans for restoration of lands affected by legacy roads in the Puget Sound.

The culvert at the Cranberry Creek crossing was identified as deteriorating infrastructure due to excessive culvert corrosion and presented a barrier to migrating fish due to high water velocity and a hydraulic jump at the outlet.

After hydraulic and geomorphic analysis and consideration of life histories of the fish species in Cranberry Creek, Snohomish County Engineers determined a 3-sided bottomless box culvert would be installed to accommodate channel bankfull width. A natural stream channel was reconfigured and defined throughout the crossing. Riparian plants species such as dogwood and willows were used to revegetate upstream and downstream banks and the constructed slopes of the road shoulder.

The Forest and Snohomish County have successfully partnered on fish passage projects in the past (Big 4 Creek and Jarsk Creek) within the last several years. The efforts have restored salmonid access to a number of miles of habitat on National Forest System lands. The new crossing structure at Cranberry Creek will allow access to over 6 miles of habitat occurring on private, state and Forest Service lands. In addition, implementing this project contributes to accomplishing priority work plan elements in the larger EPA-led Puget Sound Federal Task Force.



Newly constructed 3-sided box culvert at outlet.

Funding: EPA – \$547,490, Snohomish County – \$315,000
Total Project Cost: \$863,490

For more information on this project and other restoration projects on the Mt. Baker-Snoqualmie National Forest, contact Richard Vacirca, Fisheries Program Manager at 425-783-6040.

MT. HOOD NATIONAL FOREST

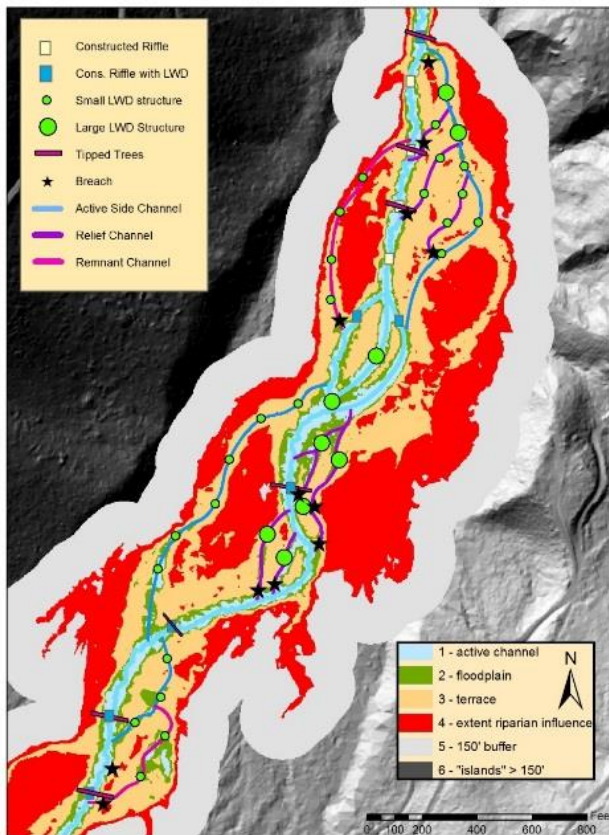
West Fork Hood River “Red Hill” Large Wood Placement

The Hood River District Fisheries Program has been working cooperatively with Confederated Tribes of Warm Springs to restore watershed conditions in the Upper West Fork Hood River. The work is guided by a Watershed Restoration Action Plan (WRAP) that identifies a suite of actions that will improve watershed function. This project has two phases. Phase 1 was completed in 2016 and phase two will be completed in 2017.

channel habitat, increase large wood densities, capture and improve the residency time of spawning sized bedload, increase the number of pools and pool spacing, and add more roughness to the floodplain.



West Fork Hood River "redhill" Restoration Project Overview



The long term goal of the West Fork “Red Hill” project is to accelerate the recovery of naturally functioning conditions within stream channels and riparian areas and improve habitat for ESA listed salmon and steelhead, as well as other stream and riparian dependent species within the project reach.

Specific project objectives are to decrease entrenchment ratios and restore floodplain connectivity, increase the two-year flow recurrence interval of floodplain inundation acreage, improve channel sinuosity and side and off-

Project elements completed in 2016 included:

- Construction of 19 large wood structures
- 430 logs added to the stream and floodplain
- 7 side channels activated; 4 side channels watered at summer low-flow
- 42 whole trees tipped
- ~280 feet of berms removed

Measurable improvements included

- Increase in-channel large wood from 56 per mile to 224 per mile.
- Increase floodplain LW to 30 per acre.
- Increase wetted length of side channels associated with sites in the project reach.

Additional partners included the Weyerhaeuser Company, the Hood River Soil & Water Conservation District, Oregon Department of Fish and Wildlife, Bonneville Power Administration, and Ecotrust.

Total project cost: \$195,368

- Confederated Tribes of the Warm Springs: \$135,100
- Whole Watershed Restoration Initiative (Ecotrust/OWEB via HRSWCD): \$10,000
- USFS: \$50,268



Before implementation at Site 3x



Before implementation at Site 3g



After implementation at Site 3x



After implementation at Site 3g

For more information on this project and other restoration projects on the Mt. Hood National Forest, contact Brad Goehring, Fisheries Program Manager at 503-668-1605.

OCHOCO NATIONAL FOREST

McKay Creek Floodplain Reconnection and Large Wood Augmentation

The McKay Creek project is a multiyear holistic approach to restoring the Upper McKay Creek Watershed, supported through the Portland General Electric Pelton Round Butte Fund. McKay Creek is a major tributary to Crooked River, where reintroduced steelhead and Redband Trout have access for spawning and rearing. Previous restoration actions in the watershed focused on the protection and restoration of wet meadows and headwater streams, in combination with upland vegetation management treatments. Those projects restored areas that were not functioning properly.

The 2016 restoration actions focused on improving water quality and salmonid spawning and rearing habitat by restoring floodplain connectivity, raising the water table elevation to promote riparian vegetation growth, improving existing channel structure and complexity by adding large woody debris, and reducing management-related riparian area impacts.



McKay Creek pre-project bank erosion, floodplain disconnection, and simple stream channel.



Wood added to McKay Creek to increase habitat complexity and improve high flow access to floodplain.

There was no net loss of dispersed campsites as a result of this project and close coordination with the grazing allotment permit holders within the project area during project planning and implementation minimized impacts to that resource use.

2017 restoration actions will treat a stream reach that was historically straightened and bermed, resulting in an incised, simplified stream channel disconnected from its floodplain. The associated lowered water table reduced riparian vegetation diversity and vitality.

For more information about this project on the Ochoco National Forest, contact Jennifer Mickelson, District Fisheries Biologist at 541-416-6485, or Jon Kochersberger, District Hydrologist at 541-416-6486.

OKANOGAN-WENATCHEE NATIONAL FOREST

South Summit II Road Decommissioning

In the summer of 2016, within the South Summit II Project Area on the Methow Valley Ranger District, a total of 3.6 miles of road were decommissioned and five culverts were removed. This work was done in partnership with the non-profit environmental group Conservation Northwest.

The goals of this project were to open up several miles of Yockey Creek for fish passage, restore hydrologic connectivity and restore soil productivity. This area also was heavily impacted by the 2014 Carlton Complex Fire and all of the culverts and roads had severe erosion and debris torrents associated with them from post-fire precipitation events. These roads were identified as having severe detrimental impacts to water quality and had been cleared for decommission before the fire occurred. Post-fire impacts elevated them to the top of the list for decommissioning.



After road decommissioning

The roads were fully recontoured and stream channels were reshaped at the crossings to mimic natural surrounding channel morphology and gradient. There was a generous supply of slash available from the fire induced mortality of trees and these were incorporated into the decommission footprint for erosion control and future nutrient availability. They also deter illegal access for future off-road recreationists.

The disturbed ground was planted with a native seed mix. This project was a great success and showed the benefit of a close working relationship with partners eager to help the USFS complete mutually beneficial projects.



Perched culvert on Yockey Creek prior to road decommissioning



Yockey Creek crossing post road decommissioning

For more information about this project on the Okanogan-Wenatchee National Forest, contact Lance George, Zone Hydrologist at 509-996-4062, or Luke Cerise, Zone Soil Scientist at 509-486-5108.

OLYMPIC NATIONAL FOREST

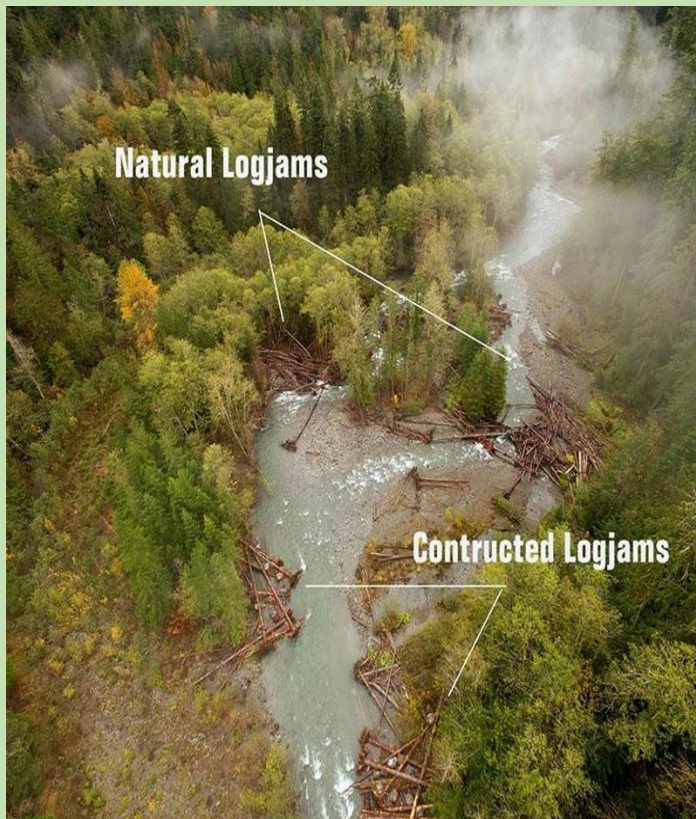
Dungeness Large Wood Enhancement

The Olympic National Forest and the Jamestown S’Klallam Tribe collaborated to implement this restoration project to improve fish habitat in Gray Wolf River, a major tributary of the Dungeness River. The floodplain and river restoration on the Gray Wolf River was designed to accelerate the recovery of channel processes, and improve fish habitat by increasing both spawning and rearing habitat. Three fish species listed as threatened under the federal Endangered Species Act (ESA) are present in the project area within the Dungeness watershed: Puget Sound Chinook, Puget Sound steelhead, and Olympic Peninsula Bull Trout. Returning numbers of all listed fish species are chronically low. Fish habitat on National Forest lands in the upper watershed act as a refugia for fish populations at risk.

Eleven strategically located log jams were constructed within the first two river miles of the Gray Wolf River. Log jams were constructed from trees and materials delivered to the river channel by helicopter.



Drone photo of Dungeness project credited to: John Gussman, Jamestown S’Klallam tribe.



Drone photo of Dungeness project credited to: John Gussman, Jamestown S’Klallam Tribe.



Placing logs into location with helicopter.

Approximately 120 second growth trees were used to provide the necessary large woody material for the project. Trees ranging from 18 to 27 inches in diameter were removed from approximately two acres of second-growth forest stands in the Adaptive Management Area land management allocation, within the Middle

Dungeness River subwatershed. All of the trees were pushed over with an excavator and removed with their roots attached. Tree removals created a variety of small openings for wildlife benefits. Final budget for the project was approximately \$500,000.

Habitat restoration in the Dungeness River is identified as a key recovery action in the recovery plan for Puget Sound Chinook. Large wood additions to the river channels are specifically identified as a priority habitat improvement within The North Olympic Peninsula Lead Entity's 2012 Three-Year Work Plan. Large wood additions to the river channels are specifically identified as a priority habitat improvement within The North Olympic Peninsula Lead Entity's 2012 Three-Year Work Plan. Large wood placement in the Dungeness and Gray Wolf Rivers is also identified as a priority restoration action in the Draft Collaborative Restoration Plan (USDA Forest Service, 2011) and was identified as an essential project in the Watershed Restoration Action Plan (USDA Forest Service, 2012).



Engineered log jam.

For more information on this project, contact Marc McHenry, Fisheries Biologist at 360-765-2231. For other restoration projects on the Olympic National Forest, contact Bob Metzger, Fisheries Program Manager at 360-956-2293.



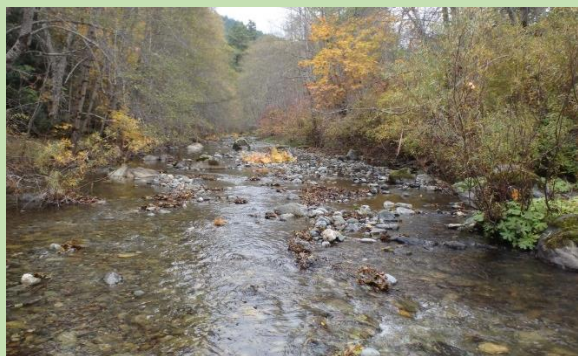
Placing logs in channel.

ROGUE RIVER-SISKIYOU NATIONAL FOREST

Dunn Creek Restoration – Phase 1

The Dunn Creek Restoration Project, located on the Wild Rivers Ranger District, Rogue River-Siskiyou National Forest, was completed in partnership with the Illinois Valley Watershed Council. The project was deemed an essential project within the priority East Fork of Illinois River Watershed Restoration Action Plan. Dunn Creek, located in California, is a tributary to the Upper East Fork of the Illinois River within the Illinois Subbasin. The priority watershed provides high quality habitat for federally listed Southern Oregon and Northern California Coasts (SONCC) Coho Salmon, steelhead, and resident salmonids. The Illinois subbasin is a major tributary to the lower Rogue River and represents some of the highest intrinsic potential in the Rogue River basin for SONCC Coho Salmon.

The project area has a history of intensive gold mining, logging, and streamside road building which has left the habitat in the lower reaches of Dunn Creek simplified, entrenched, and with limited natural recruitment potential for additional large wood. The project area can be characterized as low to moderate gradient with moderate intrinsic potential for SONCC Coho Salmon. The first phase of a multi-year implementation strategy was completed in 2016 to address the limiting factors described above.



Dunn Creek habitat prior to 2016 implementation

The main objective in 2016 was to add large wood structures to the mainstem and side channels of Dunn Creek in order to dissipate energy during high flows, capture spawning gravel, and to provide cover during high and low flow conditions. Trees were obtained for the project from an unsold, second-growth timber sale unit that was not harvested due to economic reasons. This log source has proven to be very useful in providing a large number of logs for instream restoration projects

throughout the district. The standing live trees are typically dug out and pushed over with an excavator, then cut into 35' sections to yield one log with a rootwad attached and one "saw log". Forty trees were marked and utilized for this phase of the Dunn Creek project.



Collecting project wood for habitat structures

Nine complex structures were constructed in 2016 from approximately 80 logs, half with rootwads. A combination of techniques were used to help the structures withstand the intensity of the Siskiyou flow regime – including using rock as ballast, interlacing structures into existing streamside vegetation, and keying logs into the streambank. One hundred plus inches of annual precipitation and a "flashy" geology require that structures (and fish) can withstand intense flow events with regularity. Our structures were spatially placed within the channel to direct a portion of stream flow energy laterally instead of longitudinally. The structures will aid in capturing spawning gravels, which are lacking in the project reach, as well as provide summer and winter rearing habitat for salmonids.



Dunn Creek log structure

Total project cost was approximately \$60,000.

For more information, please contact Steve Burns, Fishery Biologist, Wild Rivers Ranger District, Rogue River-Siskiyou National Forest, 541-592-4059.

SIUSLAW NATIONAL FOREST

Moon Creek Culvert Replacement (Salmon SuperHwy)



The Salmon SuperHwy (SSH) is a strategic, comprehensive, intensive effort with a diverse group of partners working across a six-river landscape to reconnect fish populations with the habitat they need by updating road crossings and other barriers to get the maximum return on investment.

The Tillamook-Nestucca watershed and the North Oregon Coast represents some of the richest salmon and steelhead recovery potential anywhere in the lower 48. The 6-river landscape on the North Oregon Coast that feeds Tillamook and Nestucca bays covers 940 square miles. Partners identified 260+ remaining barriers to fish passage throughout the Tillamook-Nestucca drainage and determined to fix them all would cost some \$140 million and take about 70 years at current spending levels. Through a detailed cost-benefit analysis, 93 projects were identified that, when replaced, will achieve maximum habitat bang-for-the buck. Replacing these barriers with appropriately sized, stream simulation crossings will result in access for 6 species of ocean-going fish to 95% of the habitat available at a cost of about \$34 million.

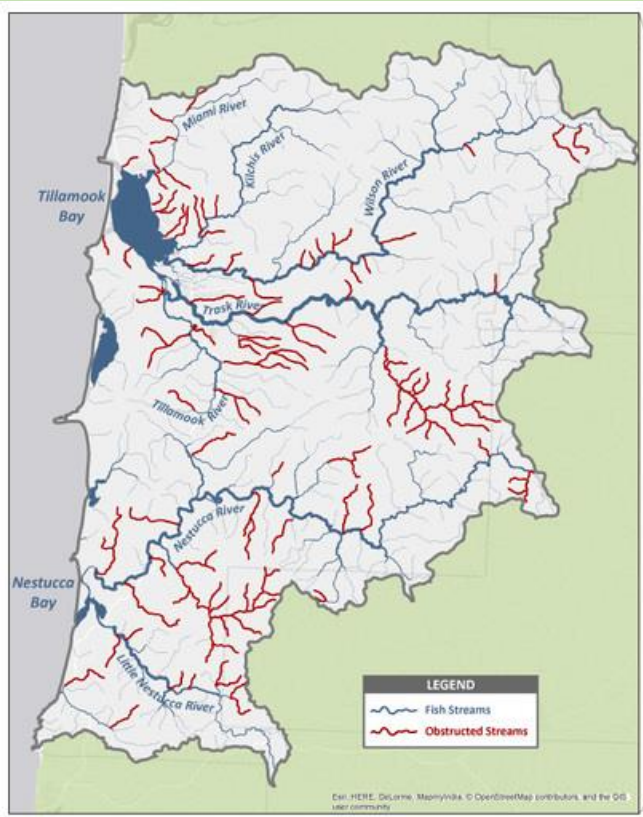
Hundreds of barriers in streams still create bottlenecks throughout Oregon's coastal watersheds, creating major problems for fish and people. Most are problem culverts at road crossings that contribute to flooding and road damage, while impeding habitat connectivity for salmon, steelhead and other migrating fish. The work to restore access for salmon and steelhead is now being tackled at a strategic level by multiple stakeholders, agencies, non-profits, and private landowners. This work is critical as fish populations are threatened more than ever by climate change, warming sea temperature levels, and reduced habitat. The Salmon SuperHwy benefits fish and wildlife through improved riparian conditions and habitat connectivity, allowing organisms to reach the high quality spawning and rearing streams on the Siuslaw National Forest by removing fish barriers. The habitat improvements accomplished help to restore natural stream function, including sediment and nutrient transport processes, and help to sustain and enhance the productivity of the Siuslaw National Forest.

2016 Accomplishments:

Cross-sector support

To date, the Salmon SuperHwy has received support from various foundations, agencies, and businesses, including Meyer Memorial Trust, National Fish & Wildlife Foundation, US Fish & Wildlife Service, Oregon Community Foundation, US Forest Service, Pelican Brewery, and individual donations. Engaging support from non-traditional and corporate donors is a key tenet of the SSH plan. SSH Executive Team members are working with two pending business donors, and pitching the program to several other corporations in the coming months. This support will not only accelerate the restoration and recovery of salmonids, but will raise awareness and community involvement in the importance of this work.

The Forest Service has actively engaged as a partner in the Salmon SuperHwy and secured approximately \$340,000 in funding from the WO in spring of 2016. These funds covered the final implementation costs for the Lower Boulder Culvert Crossing on a tributary to the Nestucca River, which will be replaced with a bridge in 2017. Other project funders include the Oregon Watershed Enhancement Board (OWEB), US Fish and Wildlife Service, and Tillamook County Public Works. Forest Service funding has also allowed FS Engineers to



move forward with the design of another culvert replacement priority on Boulder Creek (the Upper Boulder Crossing) and the design of a culvert replacement on a tributary to Limestone Creek.

Partnership project – Moon Creek Culvert Replacement

This project restored access to tributary habitat in the lower reach of Moon Creek. Moon Creek is the 2nd highest Coho producer (19,170), 1st in O+ Coho (10,605), 3rd for winter steelhead (2,385), and 4th Cutthroat Trout producer (1,555) within the Nestucca 5th field watershed (Nestucca RBA 2002-04). Surveys indicate the majority of each species occur in the lowest two miles of each Moon Creek branch. The SSH priority list identified one important fish passage barrier on a lower tributary to Moon Creek. Improving this fish passage barrier would allow fish winter refugia and summer access to cooler water, both of which are identified as limiting factors for the basin. Replacing this barrier would also improve the hydrologic connectivity of Moon Creek with its tributaries.



Moon Creek 1208 Culvert Replacement – July 2016

The Moon Creek fish passage barrier was removed in summer 2016. The undersized 2ft. wide culvert was replaced with a 12 ft. wide span arch culvert using stream simulation to provide appropriate fish habitat and accommodate natural hydrologic processes. The project was designed by US Forest Service (USFS) engineering staff and will be monitored by the watershed council, USFS and landowners. This project was on a county road adjacent to private land ownership and required the partnership and support of USFWS, Cascade Pacific Stewardship Group, Tillamook County Public Works, the Nestucca Neskowin and Sand Lake Watersheds Council and the Siuslaw National Forest. By replacing this culvert,

the project is increasing habitat access to Siuslaw National Forest lands upstream and strengthens the overall Moon Creek watershed populations making them more resilient to future impacts from stochastic events, climate change, or management impacts.

Partnership project – Five Fin Beer Campaign with Pelican Brewery

The Salmon SuperHwy partnership collaborated with Pelican Brewing Company, a local brewery located on the Oregon Coast. A portion of the sales from their new brew, Five Fin West Coast Pilsner, supports the Salmon SuperHwy partners' efforts to restore rivers and habitat throughout Oregon's North Coast. This recently launched collaboration will accomplish multiple objectives; it will educate visitors to the North Oregon Coast about the important habitat restoration work that the Salmon SuperHwy partnership is engaging in and it will raise funds to support on-the-ground project work.



Outreach

Salmon SuperHwy is committed to engaging a wide target audience in habitat restoration and salmon recovery. An extensive Social Media campaign has been launched to educate citizens about the Salmon SuperHwy via Facebook. Stunning coastal photography, Five Fin Beer information, Science Pubs, and other activities of note are publicized on the Salmon SuperHwy Facebook page: <https://www.facebook.com/SalmonSuperHwy/>

For more information on this project and other restoration projects on the Siuslaw National Forest, contact Chris Hirsch, Fisheries Program Manager at 541-750-7034. Or visit the website:

<http://www.salmonsuperhwy.org/>

UMATILLA NATIONAL FOREST

Upper North Fork Touchet River Watershed Restoration Action Plan Completion

The Upper North Fork Touchet Subwatershed is located in the Blue Mountains within southeastern Washington. A small population of migratory Bull Trout spawn and rear in the North Fork Touchet River. Mid-Columbia steelhead spawn near the forest boundary and rear throughout the system. Both species are listed as threatened under ESA. Road crossings have caused partial and total migratory barriers over the years and contribute to loss of bank stability and increased sedimentation, affecting Bull Trout spawning habitat. Major investment in restoration has taken place on this system in the last decade, including the replacement of four undersized and partial barrier culverts with bridges and the removal of another during road decommissioning.



Removal of the last aquatic barrier in the Upper North Fork Touchet watershed was an Essential Project in the Watershed Restoration Action Plan.

The Watershed Condition Framework (WCF) was implemented across all National Forests to improve the Forest Service approach to watershed restoration by establishing a consistent methodology for condition assessment and implementing integrated activities in watersheds identified as priorities for restoration. The North Fork Touchet River subwatershed was chosen as one of the Umatilla's WCF priority areas for restoration in 2012. This year, the forest completed the last two essential projects identified in our restoration plan: the replacement of an ATV trail bridge and installation of

barrier rocks preventing vehicle and campsite encroachment on the streambanks. Excluding ATVs from the river and riparian area, reducing dispersed camping, and installation of a bridge for motorized trails have all contributed to improved condition of the riparian area and reduced erosion and sedimentation into the river and on spawning gravels.



Barrier installation to prevent dispersed camping impacts.



Replacement of bridge on ATV trail

For more information on this project and other restoration projects on the Umatilla National Forest, contact Joy Archuleta, Forest Hydrologist at 541-278-3822.

UMPQUA NATIONAL FOREST

Tiller Instream Restoration

The Tiller Instream Restoration project restored large woody material back in to important habitat segments of the stream channel, using aerial based methods to develop floodplain connectivity, create velocity refuge, and accumulate spawning gravel.

Logs were hauled and stockpiled during the summer of 2016 concurrently with instream structure design. The Tiller District Fisheries Biologist designed 12 miles of stream restoration structures while overseeing implementation of log haul for the project and a separate ground based instream placement contract for the Buckeye Creek Project. A team composed of Tiller Ranger District employees implemented the helicopter contract in early October 2016.

A large, logging helicopter placed large, long maximum weight logs (20,000 – 25,000 pounds) in the stream channel following Forest Service designs. During the Stouts Creek Wildfire of 2015, a portion of the hazard trees cut in the Riparian Reserves and Late Successional Reserves were reserved for instream restoration use.

Species benefitting included Oregon Coast (OC) Coho Salmon, Critical Habitat (CHU) for Coho, OC winter steelhead, and Pacific Lamprey, with limited benefits to Fall Chinook Salmon and Spring Chinook Salmon.



For more information on this project and other restoration projects on the Umpqua National Forest, contact Bob Nichols, Fisheries Biologist at 541-825-3134.

WALLOWA-WHITMAN NATIONAL FOREST

Five Points Creek Restoration

Five Points Creek is designated critical habitat for Bull Trout, spawning and rearing habitat for Snake River Basin summer steelhead and Redband Trout, and is potential rearing habitat for spring/summer chinook. Historic timber harvest, railroad grades, and road building removed large conifers from the valley bottom, reducing the future recruitment of large wood to the stream. Historic grazing practices have impacted the riparian area. Five Points Creek Restoration is a multi-year project (2015-2017) addressing those impacts in stages.



Constructing large wood instream structures to provide complex fish habitat.

The Five Points Creek Restoration Project encompasses 6.5 miles of threatened fish habitat on the La Grande Ranger District. The project will be completed at the end of 2017. Restoration work completed in 2015/2016 included fish barrier removal, wood haul, fish structure construction, riparian planting, and ATV road closure/obliteration. The project will continue in 2017 with funding from Bonneville Power Administration (BPA). Implementation activities will include fish structure construction, fence construction, ATV trail closure/obliteration, and planting.

The valley bottom of Five Points Creek is vegetated with an array of deciduous and coniferous vegetation, including hawthorn, ponderosa pine, and Douglas-fir. The flood prone area (area that would flood in a 10-25 year flow event) is largely without vegetation. The riparian area outside of the flood prone area is well vegetated with deciduous and coniferous vegetation, with the exception

of Camp One. Within the floodprone area, there are large areas with little vegetation, indicating a large flood event in the near past. There are multiple ATV trails that are causing sedimentation and vegetation impacts to the stream and riparian area.

Livestock grazing occurs within the project area, with increased range riding used to limit livestock use in Five Points Creek. The area around Camp One will be excluded from livestock, which includes approximately 1/3 mile of stream.

An old diversion structure constructed in the late 1920s by the railroad for stream engines was located in lower Five Points Creek. The structure was a passage barrier for some or all life stages of summer steelhead, Bull Trout, and spring/summer chinook. In 2015, the structure was removed from the stream and restoration work around the site continued into 2016.



Completed large wood structure on Five Points Creek.

Funding (2015-2017)

BPA	\$797,552
USFS	\$41,942
TOTAL:	\$838,894



Pre-restoration



Placing rock for structure construction.



Post-restoration with new beaver activity



Maintaining cuttings in a nursery at Clarno, OR destined for Five Points. Creek.

2015/2016 Project Accomplishments

- 22 miles of fish passage opened through diversion barrier removal.
- Large wood/boulder structure complexes constructed at 90 sites (325 structures) over 6.5 miles (1700 large wood pieces, and 100 boulders).
- Over 3.5 miles of stream planted with cuttings (29,500 cuttings) and native grass/forb seed.
- Approximately, 715 pieces of large wood flown into Five Points Creek.

- 2.25 mile of user created ATV trails were closed and/or obliterated.

For more information on this project and other restoration projects on the Wallowa-Whitman National Forest, contact Joe Vacirca, Fisheries Program Manager at 541-523-1265.

WILLAMETTE NATIONAL FOREST

Deer Creek Floodplain Enhancement

Deer Creek is the largest tributary to the McKenzie River within the Headwaters McKenzie River Watershed and is located east of Eugene, Oregon. The subwatershed of Deer Creek is approximately 14,800 acres in size and ownership is almost entirely federal lands. Deer Creek runs approximately 8.2 miles from its headwaters to its confluence with the McKenzie River at river mile 79.

Past land management practices had impaired watershed processes and contributed to poor habitat conditions in lower Deer Creek. Riparian logging and the subsequent flood of 1964 caused complete scour of the floodplain, clearing all vegetation. Following the flood, and for years to come, the USFS salvaged most of the remaining in-stream wood. Several berms were later built to straighten the channel and prevent channel migration.



Berm shown on right



Substrate too large for spawning

These land management practices severely reduced channel and floodplain roughness and increased the transport capacity of the channel, meaning that much of the wood, gravel, and fine sediment in Deer Creek were frequently transported out of this high energy system. As a result, the recovery of large wood had been slow (less than 20 pieces of large wood per mile), the substrate was too large for spawning, and most of the flow was confined to an incised, single-thread channel that was no

longer connected to its floodplain. These conditions were severely impacting habitat for native species, including ESA-threatened Spring Chinook Salmon and Bull Trout. Major limiting factors for all fish species include: lack of spawning gravel, lack of off-channel habitat and high flow refuge, lack of deep pools, lack of cover, lack of large wood, and high summer stream temperatures.

The project was designed to restore floodplain connectivity and channel complexity and enhance habitat for native fish and wildlife in the lower 1.6 miles and 42 acres of floodplain. In 2016, 200 whole trees (24-36" dbh) were harvested from upland units, broken in half, and placed in Deer Creek with an excavator. Berm material was pushed into the mainstem channel with a dozer to raise the elevation of the incised channel. And five large (38-63" dbh) streamside trees were pulled over into the floodplain to act as key pieces. In 2017, an additional 20 trees will be pulled over to complete the project.



Incised, single-thread channel largely disconnected from its floodplain

Because an aggressive restoration approach was taken, results and benefits were immediate. A bankfull storm event in October 2016 re-activated the entire floodplain at low velocities and deposited abundant spawning-sized gravel. Instead of a single-thread channel, there are now multiple channels and slow off-channel habitat. Deep pools have already formed and fresh beaver cuttings have been observed. Ecological function and habitat condition have already been vastly improved.



Berm material being redistributed into incised mainstem channel



Large streamside tree pulled into channel as a key piece

The project increased large wood frequency in channels and across the floodplain from 20 pieces per mile to at least 300 pieces per mile, of which at least 175 pieces per mile are in the medium and large size classes. It is expected the project will dramatically improve biological productivity for native fish and wildlife, including ESA-Threatened spring Chinook Salmon and Bull Trout, Oregon Sensitive Coastal Cutthroat Trout, and economically important Rainbow Trout.

Chinook haven't spawned in Deer Creek since 1993. Our hope is for Chinook to return. This was an innovative, well-designed collaborative project implemented through the McKenzie Watershed Council. It utilized McKenzie High School and University of Oregon students to implement habitat monitoring.



Sediment sorting and gravel deposition

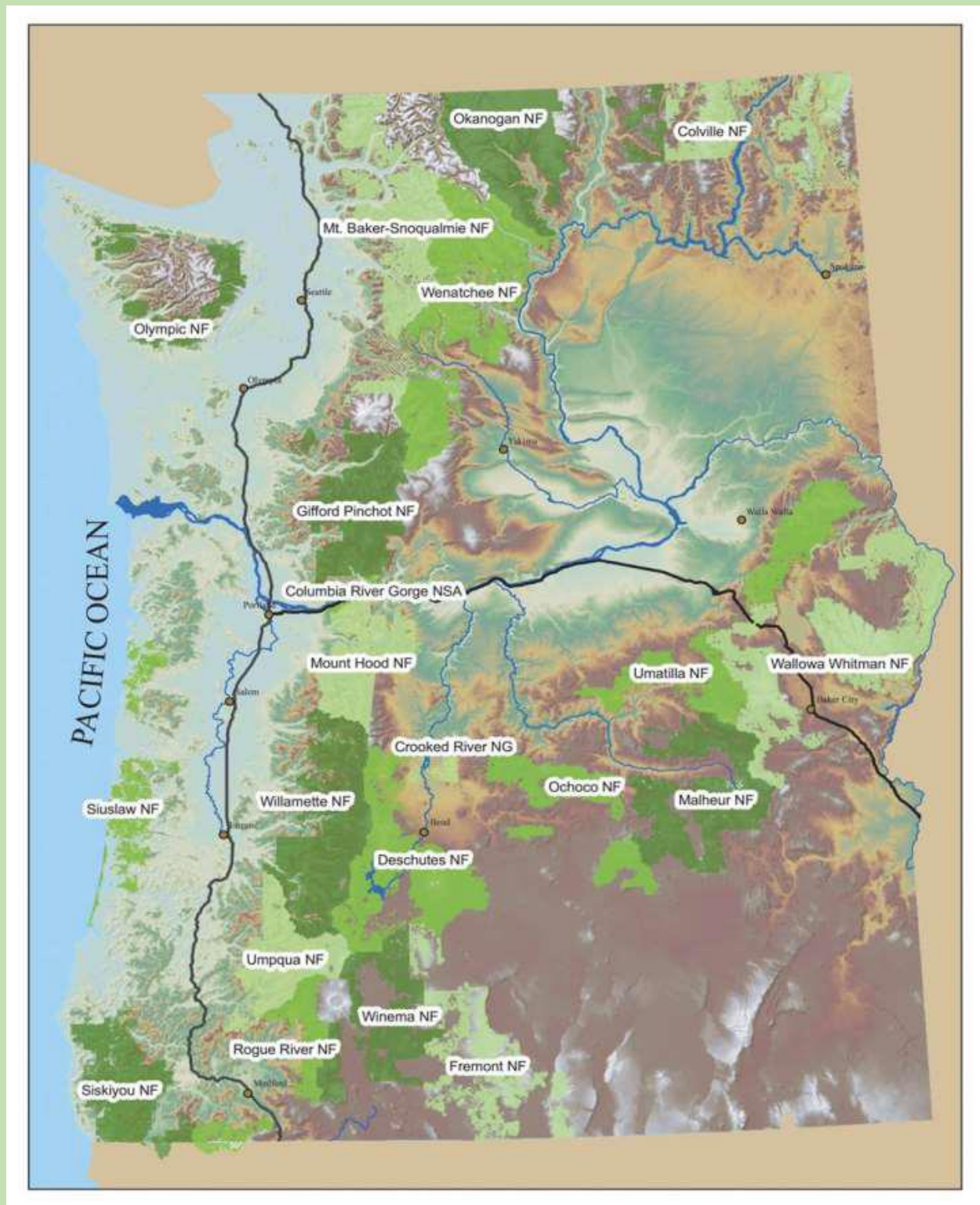
Forest Service Contribution:	\$106,500
Partner Contribution:	\$165,000
Total Project Cost:	\$271,500

For more information on this project and other restoration projects on the Willamette National Forest, contact Johan Hogervorst, Forest Hydrologist at 541-225-6430.



Large wood placement and pre- and post-project high flow conditions in the same location

Locations of Forest units in the Pacific Northwest Region of the USDA Forest Service



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